

**Amendments to the Claims**

Please amend Claims 2, 3, 4, 5, 6, 7, 8, 15, 16, 17, 19, 23, 24, 25, 29, 30 and 37. The Claim Listing below will replace all prior versions of the claims in the application:

**Claim Listing**

1. (Previously Presented) A method as claimed in Claim 37 further comprising controlling the process on a material, the controlling comprising:  
analyzing the electrical property; and  
using the analyzed result to control the process.
2. (Currently Amended) The method as claimed in Claim 1 wherein the electromagnetic sensor is a magnetic field sensor.
3. (Currently Amended) The method as claimed in Claim 2 wherein the electromagnetic sensor is an eddy current sensor.
4. (Currently Amended) The method as claimed in Claim 2 wherein the electromagnetic sensor is an eddy current sensor array.
5. (Currently Amended) The method as claimed in Claim 2 wherein the electromagnetic sensor comprises a giant magnetoresistive sensor.
6. (Currently Amended) The method as claimed in Claim 1 wherein the electromagnetic sensor is an electric field sensor.
7. (Currently Amended) The method as claimed in Claim 1 wherein the electromagnetic sensor is mounted to a surface of a material.

8. (Currently Amended) The method as claimed in Claim 1 wherein the electromagnetic sensor is scanned over a surface of a material.
9. (Original) The method as claimed in Claim 1 wherein the electrical property is magnetic permeability.
10. (Original) The method as claimed in Claim 1 wherein the electrical property is electrical conductivity.
11. (Original) The method as claimed in Claim 1 wherein analyzing the electrical property further comprises:  
comparing the monitored property with an estimated property.
12. (Original) The method as claimed in Claim 1 wherein the process is a heat treatment.
13. (Original) The method as claimed in Claim 12 further comprising:  
monitoring temperature of the material.
14. (Original) The method as claimed in Claim 13 wherein analyzing the electrical property further comprises:  
comparing the monitored property with an estimated property.
15. (Currently Amended) The method as claimed in Claim 1 further comprising:  
exposing the electromagnetic sensor to the process condition of a material.
16. (Currently Amended) The method as claimed in Claim 1 further comprising:  
exposing the electromagnetic sensor to a different process condition than the material.

17. (Currently Amended) The method as claimed in Claim 16 further comprising:  
placing an intermediate material layer between the electromagnetic sensor and the material.
18. (Original) The method as claimed in Claim 1 further comprising:  
monitoring at least one additional property.
19. (Currently Amended) The method as claimed in Claim 18 wherein the at least one additional property is the electromagnetic sensor lift-off.
20. (Original) The method as claimed in Claim 1 further comprising:  
measuring the property at multiple frequencies.
21. (Original) The method as claimed in Claim 1 wherein the process is fatigue.
22. (Original) The method as claimed in Claim 1 wherein the process condition is damage.
23. (Currently Amended) A method as claimed in Claim 37 further comprising calibrating a electromagnetic sensor in-situ, said calibration comprising:  
using a known relationship between the process condition and the electrical property to determine a calibration coefficient that adjusts the electromagnetic sensor response to provide an electrical property value that corresponds to the process condition..
24. (Currently Amended) The method as claimed in Claim 23 wherein the electromagnetic sensor is an eddy current sensor.
25. (Currently Amended) The method as claimed in Claim 23 wherein the electromagnetic sensor is an eddy current sensor array.

26. (Original) The method as claimed in Claim 23 wherein the electrical property is electrical conductivity.
27. (Original) The method as claimed in Claim 23 wherein the process condition is a change in temperature of the material.
28. (Previously presented) A method as claimed in Claim 37 further comprising determining a relationship between a process condition and an electrical property of a material, said determination comprising:
  - measuring said electrical property for at least two different process conditions;
  - and
  - using measured values to determine the relationship between the process condition and the electrical property.
29. (Currently Amended) The method as claimed in Claim 28 wherein the electromagnetic sensor is an eddy current sensor.
30. (Currently Amended) The method as claimed in Claim 28 wherein the electromagnetic sensor is an eddy current sensor array.
31. (Original) The method as claimed in Claim 28 wherein the electrical property is electrical conductivity.
32. (Original) The method as claimed in Claim 28 wherein the process comprises changing temperature of the material.
33. (Original) The method as claimed in Claim 32 wherein the electrical property is electrical conductivity.

34. (Original) The method as claimed in Claim 33 wherein the relationship between the temperature and the conductivity is linear.
35. (Original) The method as claimed in Claim 32 wherein measurements used to determine the relationship are performed during an initial heat treatment.
36. (Original) The method as claimed in Claim 32 further comprising:  
controlling the process to minimize divergence of a measured property from a property estimated from said relationship.
37. (Currently Amended) A method for calibrating a sensor for use in process control, said method comprising:  
disposing an electromagnetic field sensor proximate to a material that has at least one electrical property that varies with a process condition, the electromagnetic sensor being sensitive to the at least one electrical property;  
disposing a material state sensor proximate to a test material, the material state being temperature sensor using a non electromagnetic sensing method;  
measuring the material state sensor at two or more different states to calibrate the electromagnetic field sensor response based on a relationship between the process condition electrical property and the material state, using the calibrated electromagnetic sensor response being used as an input to a process controller; and  
monitoring the relationship between the a process condition and the material state electromagnetic sensor response to detect changes in the relationship between the electrical property and the material state caused by the process, said changes in the relationship being input to a process controller.